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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER FORD, NATHAN K				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/533,932

Applicant(s)

NISHIBAYASHI, TAKAHIRO

Examiner

NATHAN K. FORD

Art Unit

1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 December 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 3-18, 20-23 and 26-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 3-18, 20-23, 26-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SF/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION***Applicant's Response***

Acknowledged is the applicant's response, received on December 7, 2007. Claims 1, 3, 7, 9, and 13 have been amended. Claims 2, 19, and 24-25 are canceled. Claims 26-29 have been added.

The arguments presented by the applicant are not drawn to the examiner's rejection of the original set of claims but rather to the deficiencies of the prior art vis à vis the newly amended claims. Thus, the rejection of the amended claims is also a response to the arguments presented in the applicant's response.

Due to the number of references required to reject newly amended claim 1, the original rejection under Hayashi in view of Hirose has been withdrawn. A new rejection, Masao in view of Hirose, is submitted hence.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 7-12, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masao, JP 2002-064044, wherein machine translation was used, in view of Hirose, US 5,762,745.

Claims 1, 12: Masao teaches the following:

- A process section (2) (Drawing 3);
- A transfer section (12) for transferring the substrate to the process section;
- A transfer mechanism (TR) for transferring the substrate between the transfer section and the process section (Drawing 3; [0017]);
- Multiple process towers within the process section (Drawing 2);
 - Wherein a tower consists of a plurality of stacked process units housed in casings (SD1, HP1, HP2, etc.);
 - Wherein a tower includes a coating unit (SC1) with a chemical liquid [0018];
 - Wherein a tower includes a heating unit (HP1-4) to heat the substrate [0020];
 - Wherein the coating unit (SD1) is below the heating unit;
 - Wherein unit ACU serves as an air passageway interposed between the heating unit and coating unit;
 - Wherein an air blowing mechanism (32) is connected to the coating unit and configured to blow air;

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- Since the air moves through air conditioning units directly before its entry to the coating unit, its temperature and humidity is controlled;
- Wherein the air passageway (ACU) is connected to an exhaust device (39) through both the exhaust passageway (10) and the coating unit (SC).

Regarding the claim elements drawn to process sequencing, substrate transfer sequencing, the composition of the chemical liquid, and the attainment of heat insulation within an air passageway: A recitation concerning the manner in which a claimed apparatus is to be employed does not differentiate the apparatus from prior art satisfying the claimed structural limitations (*Ex parte Masham*, 2 USPQ2d 1647). Masao's apparatus has the capability to perform each of these functions.

Direction of the air moving through the passageway: It would be possible to reverse the air direction merely by configuring the blowing fans reversibly. This would be within the capacity of one of ordinary skill. Other modest rearrangements concerning the placement of the exhaust outlet or casing positions to accommodate the reversal of airflow would be within the capacity of one of ordinary skill. Further, it has been held that rearranging the parts of an invention involves only routine skill in the art.

Masao discloses neither the processing tower nor the individual process units as being detachable. Hirose, disclosing a substrate processing apparatus, teaches vertically stacked process units (21-23) that collectively compose the process tower; each unit is individually detachable to enable cleaning or maintenance (3, 39-46; 1, 38-44; claim 1). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to conceive Masao's process tower and process units as detachable in the manner taught by Hirose to enable cleaning and maintenance.

Claim 7: Drawing 2 of Masao delineates a second, lower heating (HP2) unit and a refrigeration (CP1) unit, wherein both are disposed between the coating unit (SC) and the heating unit (HP1). These former units function to modulate or control the temperature of the substrate prior to its entry to the coating unit.

Claim 8: Masao teaches a plurality of processing towers (SC1, SC2, etc.).

Claims 9-11: A recitation concerning the manner in which a claimed apparatus is to be employed does not differentiate the apparatus from prior art satisfying the claimed structural limitations (*Ex parte Masham*, 2 USPQ2d 1647).

Claim 26: The exhaust port, the collective outlet of 36, 31, and 37, is located below the heating units (HP). Nevertheless, it would require only ordinary skill to construct a vertical extension to the exhaust conduit such that

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the gases are outlet at a position above the heaters. Potentially, the extension conduit would run parallel and contiguous to conduit 31 of Drawing 3 (although the exhaust would flow in an opposite direction). Further, it has been held that rearranging the parts of an invention involves only routine skill in the art (*In re Japikse*, 86 USPQ 70).

Claims 6, 17-18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masao in view of Hirose and in further view of Hayashi, US 6,350,316.

Claim 6: Masao's apparatus comprises a carrier (ID), such as an FOUNDRY OVERLAY PROCESS (FOUP), which houses a plurality of substrates disposed in the substrate transfer section [0042]. Concerning the amount of time the substrates are stored in a transfer unit, which is interpreted as being inclusive of any chamber or casing wherein a wafer is capable of being housed: A recitation concerning the manner in which a claimed apparatus is to be employed does not differentiate the apparatus from prior art satisfying the claimed structural limitations. Also disclosed is a transfer device (TR) which transfers the substrate between a transfer unit and a plurality of process units (Drawing 2).

Masao does not teach a second transfer unit which transfers the substrate between the carrier (ID) and the transfer unit (TR). Hayashi, teaches essentially the same setup -- a transfer device (18) which conveys a wafer between process chambers (Fig. 3) and a carrier (CSB) disposed in the transfer section (3) -- further teaches a second transfer unit disposed in the transfer section which conveys a substrate between the carrier and the transfer unit, thereby indicating the suitability of the arrangement for purposes of wafer transport (6, 14-24). It would have been obvious to one of ordinary skill in the art at the time the invention was made to augment the apparatus of Masao with an additional transfer device to achieve the predictable result of rapid and efficient wafer conveyance.

Claim 17: Masao teaches the inclusion of an after-exposure baking unit to perform adhesion strengthening treatment [0032]. Further, the heating units, which comprise hot plates, can also perform a curing function [0020]. Regarding the placement of the curing unit: Masao is silent regarding the position of the after-exposure baking unit, and the heating units are disposed within the process section itself. Nevertheless, it has been held that rearranging the parts of an invention involves only routine skill in the art (*In re Japikse*, 86 USPQ 70). Rearranging the curing unit from a position within the processing section to a site directly adjacent would entail only ordinary skill.

Claim 18: Masao teaches units (HIP) capable of performing curing functions, but these units are stacked within the substrate process section rather than adjacent to it (Drawing 2). Nevertheless, stacked curing units are well-known in the art. Figure 3 of Hayashi, as described in the previous correspondence, delineates multiple curing units (20) stacked atop of each other to compose a tower (16). Given this teaching, it would have been obvious to one of ordinary skill in the art at the time the invention was made to supplement the apparatus of Masao with a tower of

curing units to achieve the predictable result of increased throughput and efficient substrate transfer. Further, it has been held that rearranging the parts of an invention involves only routine skill in the art.

Claim 20: Masao only provides a general description of the coating units and does not designate their internal structures in detail. It would have been obvious for one of ordinary skill to consult a secondary reference to supplement the deficiencies of a primary reference. In this case, Hayashi, as described in the previous correspondence, discloses a coating unit suitable for incorporation within the apparatus of Masao. The unit comprises a horizontal substrate support (45); a chemical liquid supply nozzle (46) (6, 39-41); a cup (42) surrounding the substrate and fixedly attached to, and thus held by, the said substrate support (6, 53-55); and an exhaust port (50) at the cup base (6, 63-64).

As Figure 4 delineates, the exhaust port outlets the waste beneath the process section, but Hayashi is silent as to the destination of the waste. However, Hayashi teaches several processes wherein the collective waste is discharged into a chemical liquid storage tank (31). Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to accumulate waste liquid from the coating section in the same or an additional storage tank to prevent hazardous chemical species from dispersing into an unprotected environment. Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the interior structures of Hayashi's coating unit within the coating unit of Masao to achieve the predictable result of forming an insulating film on a substrate.

Claims 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masao in view of Hirose and Hayashi and in further view of Nakai, US 6,071,047. These claims are drawn to structures within the coating unit taught by Hayashi and incorporated within Masao under claim 20. As such, only Hayashi is referenced under this rejection.

Hayashi teaches a coating supply source (47) for storing the chemical liquid used in the coating process (5, 22-25). The means that provides the chemical liquid to the supply nozzle (46) from the supply source tank (47) is unspecified, i.e., Hayashi does not teach a pump.

Supplementing Hayashi is Nakai, disclosing an apparatus for feeding a coolant liquid to a workpiece. As Figure 10 delineates, Nakai teaches a pump (P1) that delivers a liquid to a nozzle (3) from a tank (101); the nozzle disperses the liquid over a workpiece (105) (10, 32-48). Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ a pump in the apparatus of Hayashi in the manner taught by Nakai given the latter's indication as to the suitability of availing a pump to provide a liquid to a nozzle from a tank.

The configuration requirements cited in claims 22 and 23 – arranging the pump “sideward of the chemical liquid tank” or on an “upper side” of the same tank – are nothing more than a rearrangement of parts that a person of ordinary skill could have reasonably predicted given the structure of Hayashi. It has been held that rearranging the parts of an invention entails only routine skill in the art (*In re Japikse*, 86 USPQ 70).

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Masao in view of Hirose and in further view of Mahara et al., US 6,309,116

Masao does not teach a device that measures film-thickness. However, the need to obtain a desired level of film thickness during the coating process is well-known in the art, thereby demonstrating the need for a device that can measure such thickness. Supplementing Masao is Mahara, who discloses a substrate processing system. Mahara avails a device (60) that measures the film-thickness of a wafer following a coating process (6, 42-47; 8, 20-26). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to augment the apparatus of Masao with the film-thickness measuring device of Mahara to achieve the predictable result of determining the thickness of wafer-films following a coating process.

Regarding placement: The casing must be contiguous to the coating units of Masao to enable the measurement of the film. Since it has been held that rearranging the parts of an invention involves only routine skill in the art (*In re Japikse*, 86 USPQ 70), the precise placement of the casing does not bear patentable weight; nevertheless, one of ordinary skill in the art would recognize the benefit of positioning the casing between the coating unit and heating unit to forestall undesired changes in temperature.

Claims 13, 15-16, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Davis et al., US 5,248,636.

Claim 13: Hayashi teaches the following:

- A process section (1) (5, 11-14);
- A transfer section (3) for transferring the substrate to the process section (6, 14-25);
- A transfer mechanism for transferring the substrate between the transfer section and the process section (6, 14-25);
- Multiple process towers (16, 17, the collective area comprising units 11 and 13 in Figure 2, the collective area comprising units 12 and 14 in Figure 2) within the process section (5, 26-35; Figs. 1, 3);
 - Wherein a tower consists of a plurality of stacked process units (elements 11-14, 19-26);

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- o Wherein a tower includes a coating unit (12, 13) with a chemical liquid (8, 33-39);
 - Wherein that liquid is a component of the insulating film that coats the substrate (1, 5-8);
- o Wherein a tower includes a heating unit (19, 22, 23) to heat the coated substrate (5, 34-45);
- Multiple curing process chambers (20) (Fig. 3);
- A curing unit, taken as comprising curing process chambers (20) and a load-lock chamber (CSB), the latter of which is connected to the process chambers via a substrate transfer apparatus;
- o Wherein the load-lock chamber has a load port (cassette mounting table) (6, 14-20).

Hayashi is silent regarding the capability of the apparatus to modify the pressure within the load-lock. Davis supplements this omission in teaching a load lock pressure controller (704) that modulates pressure according to chamber cleaning cycles (53, 55ff). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate a load-lock pressure controller within the apparatus of Hayashi to facilitate the purging of undesirable contaminants from the chamber.

Claim 15: As Figure 3 of Hayashi delineates, only a solitary heating unit (19) is disposed above the curing unit (20). However, even if the units were transposed as the applicant's claim warrants, the same predictable result would be obtained. As such, the modification claimed by the applicant is merely a rearrangement of parts, which entails only routine skill and is unpatentable (*In re Japikse*, 86, USPQ 70).

Claim 16: Figure 3 of Hayashi delineates multiple curing units (20) stacked atop of each other to compose a tower (16).

Claim 29: Hayashi's process tower comprises multiple hot plate units designated as curing units (5, 34-44). If the plates are separable, they become capable of accommodating the substrate during its transfer to and from the load-lock chamber. Since it has been held that constructing a formerly integral structure separably involves only routine skill in the art (*Nerwin v. Erlichman*, 168 USPQ 177), it would have been obvious to one of ordinary skill to dispose the hot plates of Hayashi separably. Following this modification, the hot plates of Hayashi are capable of transferring the substrate to a load-lock chamber. Further, a recitation concerning the manner in which a claimed apparatus is to be employed does not differentiate the apparatus from prior art satisfying the claimed structural limitations (*Ex parte Masham*, 2 USPQ2d 1647).

Claims 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Davis and in further view of Komori et al., US 2001/0015412.

Hayashi's curing unit does not employ an electron beam irradiating mechanism. Komori discloses an electron beam irradiation processing device and uses the device to cure semiconductors layered with an insulating film, thereby indicating the suitability of using an electron beam irradiating mechanism to cure a substrate layered with an insulating film ([0004], [0025], Abstract). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to cure the substrates of Hayashi with electron beam of Komori given the latter's indication toward the suitability of availing an electron beam to cure a substrate layered with an insulating film.

Claims 3 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Hirose and in further view of Kwon, US 6,192,291. Hayashi, as described under claim 13, fully addresses the structural elements claimed in the former half of Applicant's claim 3, wherein Hirose renders the use of detachable process units obvious as detailed in claim 1. Together, Hayashi and Hirose do not teach those claim elements which follow the introduction *further wherein* and are drawn to substrate ID numbers; the omission is addressed below.

Hayashi does not delegate ID numbers to processing chambers. Kwon, disclosing a method of individually processing semiconductor wafers, avails a technology wherein an operator arbitrarily designates a wafer with a code or symbol which is correlated to a unique processing sequence (2, 31-59). (A processing sequence may include multiple transfers to multiple processing stations.) Thus, inherently, the computer which internalizes the code must be capable of differentiating among the multiple chambers to modulate the chamber conditions according to the requirements of the unique wafer being processed. Hence, to differentiate among the chambers, each chamber must be identifiable and must possess an ID. Therefore, Kwon teaches the designation of unique ID numbers to multiple processing stations. It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the ID technology of Kwon within the apparatus of Hayashi to enable customized wafer processing.

Claim 28: It would have been obvious to one of ordinary skill in the art at the time the invention was made to configure the apparatus limned under claim 3 to recognize a new set of processing chambers for purposes of economy. If the apparatus was incapable of such recognition, processing would cease, thereby effacing the intended purpose of the apparatus itself – to fabricate functional substrates. It would be well within the capability of one of ordinary skill to program the control computer to recognize the newly introduced processing stations.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Hirose and Kwon, and in further view of Mahara et al., US 6,309,116.

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Hayashi does not teach a device that measures film-thickness. However, Hayashi does address the need to obtain a desired level of film thickness during the coating process, thereby demonstrating the need for a device that can measure such thickness (9, 1-5). Supplementing Hayashi is Mahara, who discloses a substrate processing system. Mahara avails a device (60) that measures the film-thickness of a wafer following a coating process (6, 42-47; 8, 20-26). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to augment the apparatus of Hayashi with the film-thickness measuring device of Mahara to satisfy the former's need to determine the thickness of wafer-films following a coating process. Given Hayashi's indication as to the significance of achieving the proper film thickness, it would be obvious further to control the coating process according to the thickness level deposited on the wafer.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Hirose and Kwon, and in further view of Akagi et al., US 4,999,215.

As stated under claim 4, Hayashi does not teach a device that measures film-thickness but does address the need to obtain a desired level of film thickness during the coating process, thereby demonstrating the need for a device that can measure such thickness (9, 1-5). Akagi, disclosing a method for the manufacture of a polyimide film, avails a heater for evaporation purposes (5, 48ff). The temperature of the within the heater is manipulated according to the readings of a film thickness sensor that measures evaporation rates. Further, Akagi establishes an automatic control system by "forming a negative feedback loop for the film thickness sensor and the power source of the heating means by way of a film thickness control device," (6, 6-8). It would have been obvious to one of ordinary skill in the art at the time the invention was made to augment the apparatus of Hayashi with the film-thickness measuring device of Akagi to satisfy the former's need to determine the thickness of wafer-films following a coating process. Given Hayashi's indication as to the significance of achieving the proper film thickness, it would be obvious further to control the heating process according to the thickness level deposited on the wafer.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, THIS ACTION IS MADE FINAL. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a). A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension

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fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nathan K. Ford whose telephone number is 571-270-1880. The examiner can normally be reached on M-F, 8:30-5:00 EDT. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

/Michael Cleveland/

Supervisory Patent Examiner, Art Unit 1792